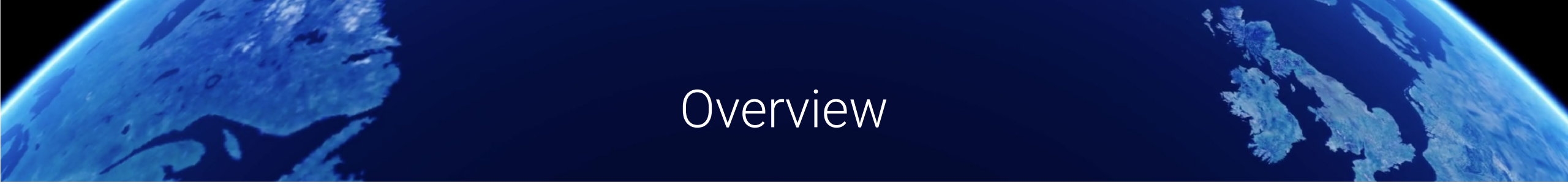




RVSM Above FL410 in the North Atlantic Region

ASE Technical Interchange Meeting
Seattle (WA), USA
9th – 11th September 2025





Overview

- Introductions
- NAT Operational Context
- NAT Height Monitoring
- ASE Performance Analysis
- RMA Considerations
- What next?
- Any questions

Introductions



Noel Dwyer
Nav Canada

Director ATS Standards



David Lunan
NATS

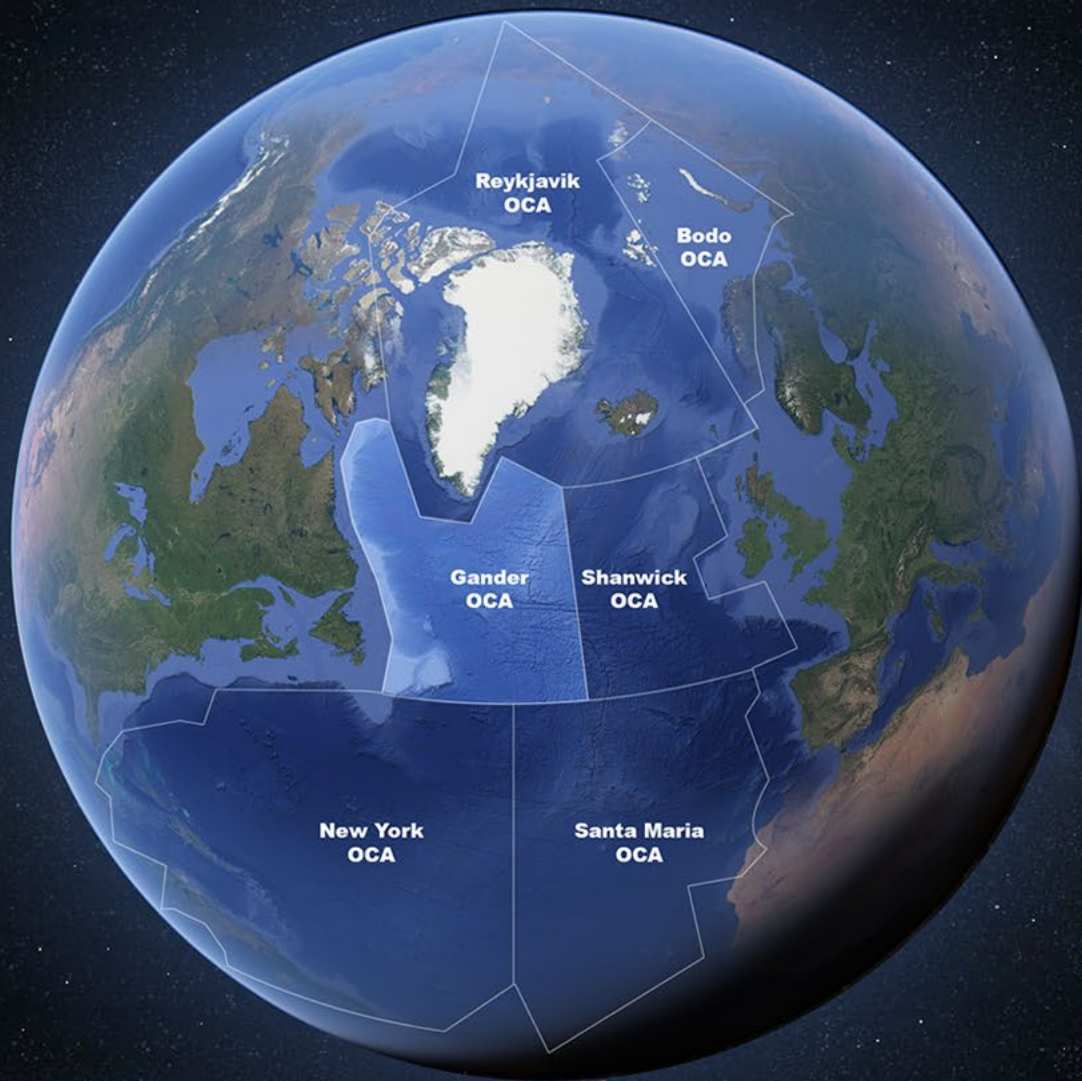
Manager,
NAT Central Monitoring Agency



Jon Plomer
NATS

Senior Analyst





- **The North Atlantic (NAT) Region**

- The world's **busiest** oceanic airspace, primarily servicing air traffic flying between North America and Europe.

500 k

Total oceanic movements per year throughout the entire NAT airspace.

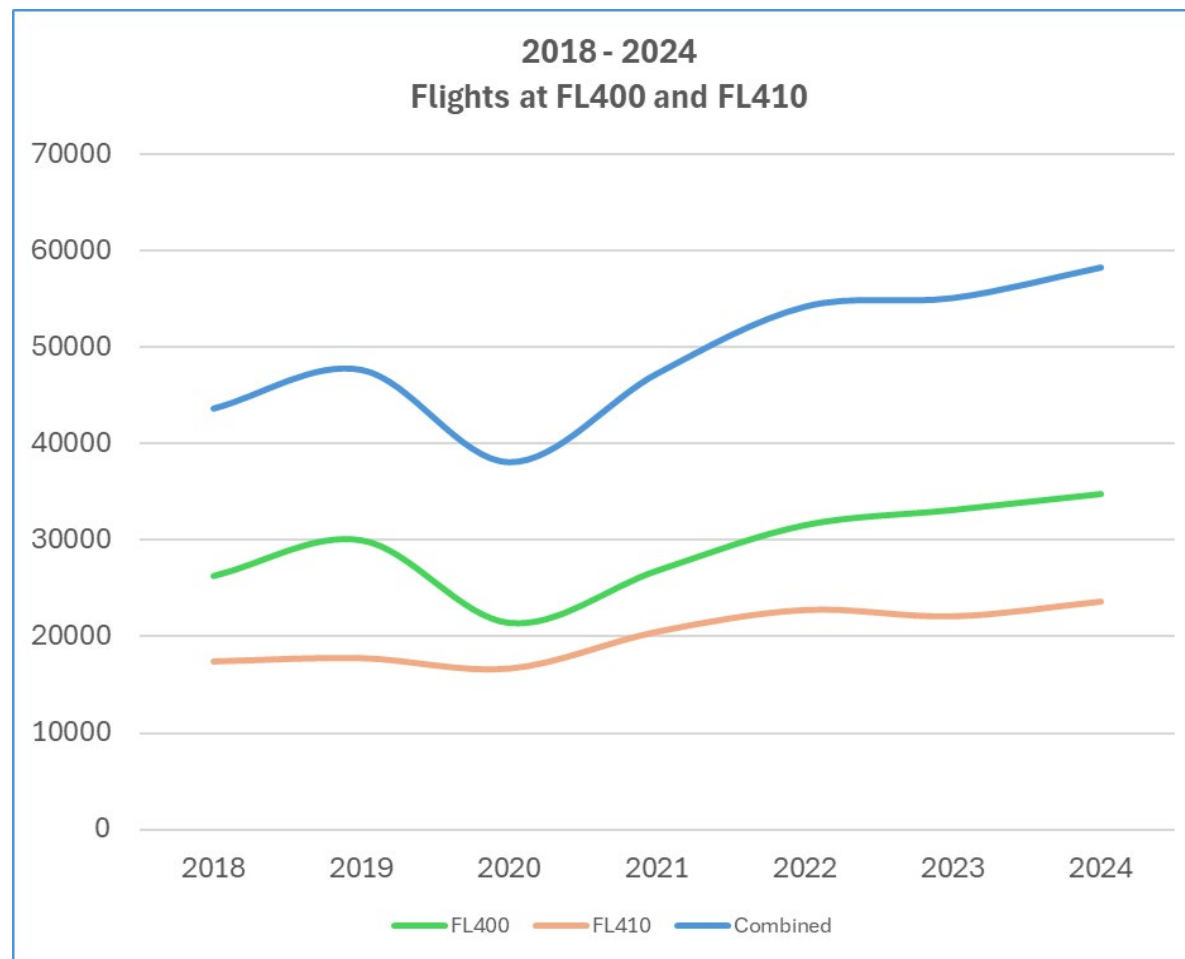
80%

Of NAT traffic flies between Canada & the UK (Gander & Shanwick OCAs).

12 k

Flights per week serviced by Canada during peak periods.

FL400/FL410 NAT Usage



FL400/FL410 by Type

Gander OCA Flights at FL 400 and FL 410 2024				
AC Type	Flights at FL400	Flights at FL410	Total	Cumulative % of Total
B788	8,307	5,362	13,669	23%
A359	6,333	5,097	11,430	43%
B789	4,063	2,395	6,458	54%
A332	3,392	1,084	4,476	62%
A333	2,708	625	3,333	67%
GLEX	827	1,703	2,530	72%
A35K	1,488	566	2,054	75%
B772	1,620	426	2,046	79%
A339	1,478	323	1,801	82%
GLF5	442	925	1,367	84%
GLF6	456	877	1,333	87%
FA7X	407	587	994	88%
A388	799	127	926	90%
GLF4	295	535	830	91%
GL5T	108	340	448	92%
FA8X	174	263	437	93%
GA6C	150	282	432	94%
GL7T	137	290	427	94%
B78X	322	91	413	95%
F900	196	176	372	96%
F2TH	141	210	351	96%
B744	112	229	341	97%
B763	73	96	169	97%
GA5C	44	104	148	97%
B77L	37	92	129	98%
CL35	28	101	129	98%
B748	20	103	123	98%
C700	40	80	120	98%
E550	41	79	120	98%
Other	499	429	928	100%
Total	34,737	23,597	58,334	

Flight Level Usage with RVSM Approval

2024 Flights FL290 and above				
Flight Level	Flights	% of Total	Filed RVSM	
			Approved	% of Flights
510	2	0.0%	2	100.0%
490	34	0.0%	34	100.0%
470	685	0.1%	679	99.1%
450	5,571	1.1%	5,467	98.1%
430	9,858	2.0%	9,708	98.5%
410	23,597	4.7%	23,275	98.6%
400	34,737	7.0%	34,306	98.8%
390	66,059	13.3%	65,227	98.7%
380	70,136	14.1%	69,238	98.7%
370	72,158	14.5%	71,229	98.7%
360	64,019	12.9%	63,295	98.9%
350	57,329	11.5%	56,638	98.8%
340	45,390	9.1%	44,842	98.8%
330	22,603	4.5%	22,321	98.8%
320	15,608	3.1%	15,350	98.3%
310	5,901	1.2%	5,784	98.0%
300	1,867	0.4%	1,842	98.7%
290	1,301	0.3%	1,274	97.9%
Total	496,855		490,511	98.7%

Annex 2 App 3 – Assignable Flight Levels

Annex 11 – Air Traffic Services

3.3.5 Separation by an air traffic control unit shall be obtained by at least one of the following:

- vertical separation, obtained by assigning different levels selected from:
 - the appropriate table of cruising levels in Appendix 3 of Annex 2, or
 - a modified table of cruising levels, when so prescribed in accordance with Appendix 3 of Annex 2 for flight above FL 410,

PANS-ATM

5.3 Vertical Separation

5.3.2 Vertical separation minimum

The vertical separation minimum (VSM) shall be:

- a nominal 300 m (1 000 ft) below FL 290 and a nominal 600 m (2 000 ft) at or above this level, except as provided for in b) below; and
- within designated airspace, subject to a regional air navigation agreement: a nominal 300 m (1 000 ft) below FL 410 or a higher level where so prescribed for use under specified conditions, and a nominal 600 m (2 000 ft) at or above this level.

Note.— Guidance material relating to vertical separation is contained in the Manual on a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).

APPENDIX 3. TABLES OF CRUISING LEVELS

The cruising levels to be observed when so required by this Annex are as follows:

RVSM — FEET

- in areas where feet are used for altitude and where, in accordance with regional air navigation agreements, a vertical separation minimum of 1 000 ft is applied between FL 290 and FL 410 inclusive.*

TRACK**											
From 000 degrees to 179 degrees***						From 180 degrees to 359 degrees***					
IFR Flights			VFR Flights			IFR Flights			VFR Flights		
Level			Level			Level			Level		
FL	Feet	Metres	FL	Feet	Metres	FL	Feet	Metres	FL	Feet	Metres
010	1 000	300	—	—	—	020	2 000	600	—	—	—
030	3 000	900	035	3 500	1 050	040	4 000	1 200	045	4 500	1 350
050	5 000	1 500	055	5 500	1 700	060	6 000	1 850	065	6 500	2 000
070	7 000	2 150	075	7 500	2 300	080	8 000	2 450	085	8 500	2 600
090	9 000	2 750	095	9 500	2 900	100	10 000	3 050	105	10 500	3 200
110	11 000	3 350	115	11 500	3 500	120	12 000	3 650	125	12 500	3 800
130	13 000	3 950	135	13 500	4 100	140	14 000	4 250	145	14 500	4 400
150	15 000	4 550	155	15 500	4 700	160	16 000	4 900	165	16 500	5 050
170	17 000	5 200	175	17 500	5 350	180	18 000	5 500	185	18 500	5 650
190	19 000	5 800	195	19 500	5 950	200	20 000	6 100	205	20 500	6 250
210	21 000	6 400	215	21 500	6 550	220	22 000	6 700	225	22 500	6 850
230	23 000	7 000	235	23 500	7 150	240	24 000	7 300	245	24 500	7 450
250	25 000	7 600	255	25 500	7 750	260	26 000	7 900	265	26 500	8 100
270	27 000	8 250	275	27 500	8 400	280	28 000	8 550	285	28 500	8 700
290	29 000	8 850				300	30 000	9 150			
310	31 000	9 450				320	32 000	9 750			
330	33 000	10 050				340	34 000	10 350			
350	35 000	10 650				360	36 000	10 950			
370	37 000	11 300				380	38 000	11 600			
390	39 000	11 900				400	40 000	12 200			
410	41 000	12 500				430	43 000	13 100			
430	43 000	13 100				470	47 000	14 350			
490	49 000	14 950				510	51 000	15 550			
etc.	etc.	etc.				etc.	etc.	etc.			

* Except when, on the basis of regional air navigation agreements, a modified table of cruising levels based on a nominal vertical separation minimum of 1 000 ft (300 m) is prescribed for use, under specified conditions, by aircraft operating above FL 410 within designated portions of the airspace.

** Magnetic track, or in polar areas at latitudes higher than 70 degrees and within such extensions to those areas as may be prescribed by the appropriate ATS authorities, grid tracks as determined by a network of lines parallel to the Greenwich Meridian superimposed on a polar stereographic chart in which the direction towards the North Pole is employed as the Grid North.

*** Except where, on the basis of regional air navigation agreements, from 090 to 269 degrees and from 270 to 089 degrees is prescribed to accommodate predominant traffic directions and appropriate transition procedures to be associated therewith are specified.

Note.— Guidance material relating to vertical separation is contained in the Manual on Implementation of a 300 m (1 000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive (Doc 9574).

Current Operational Scenario (FL420 optimal)

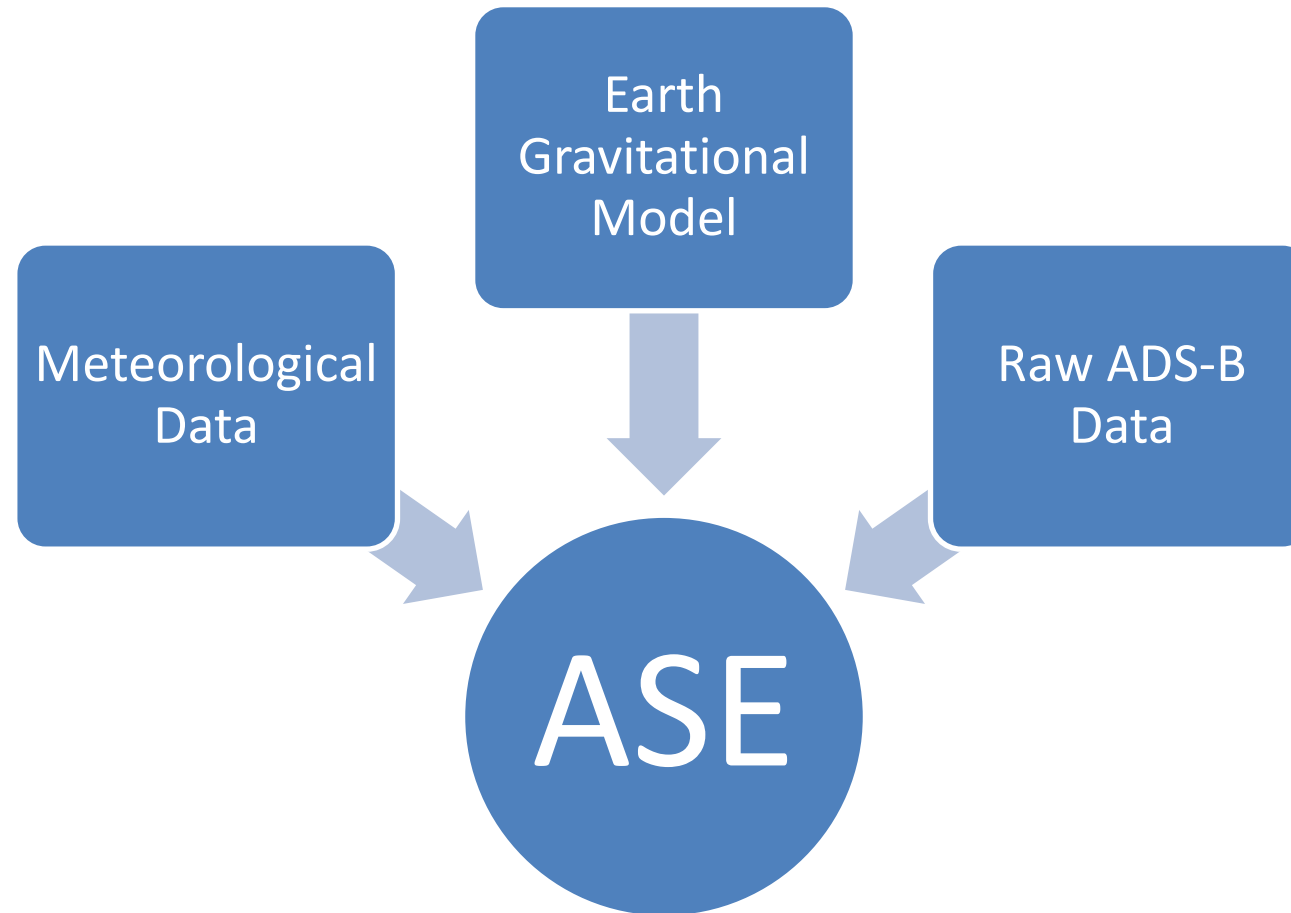




NAT Height Monitoring

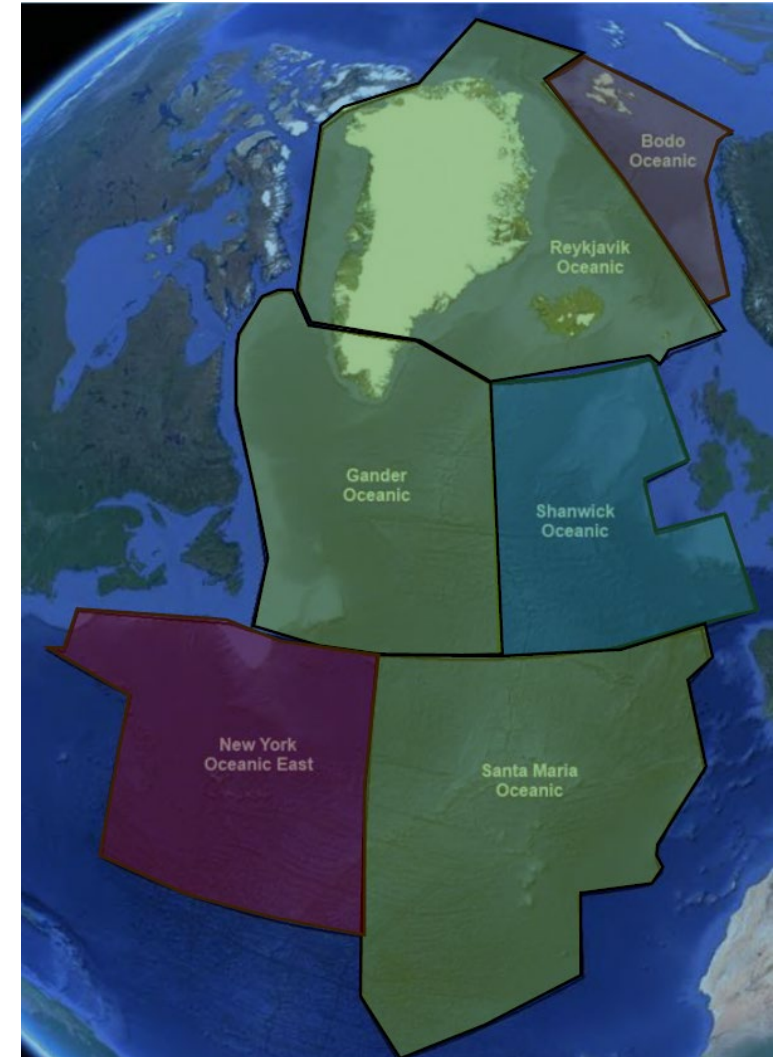
- Background
- NAT HMS Capability
- Validating ASE tool for use above FL410

NAT Height Monitoring



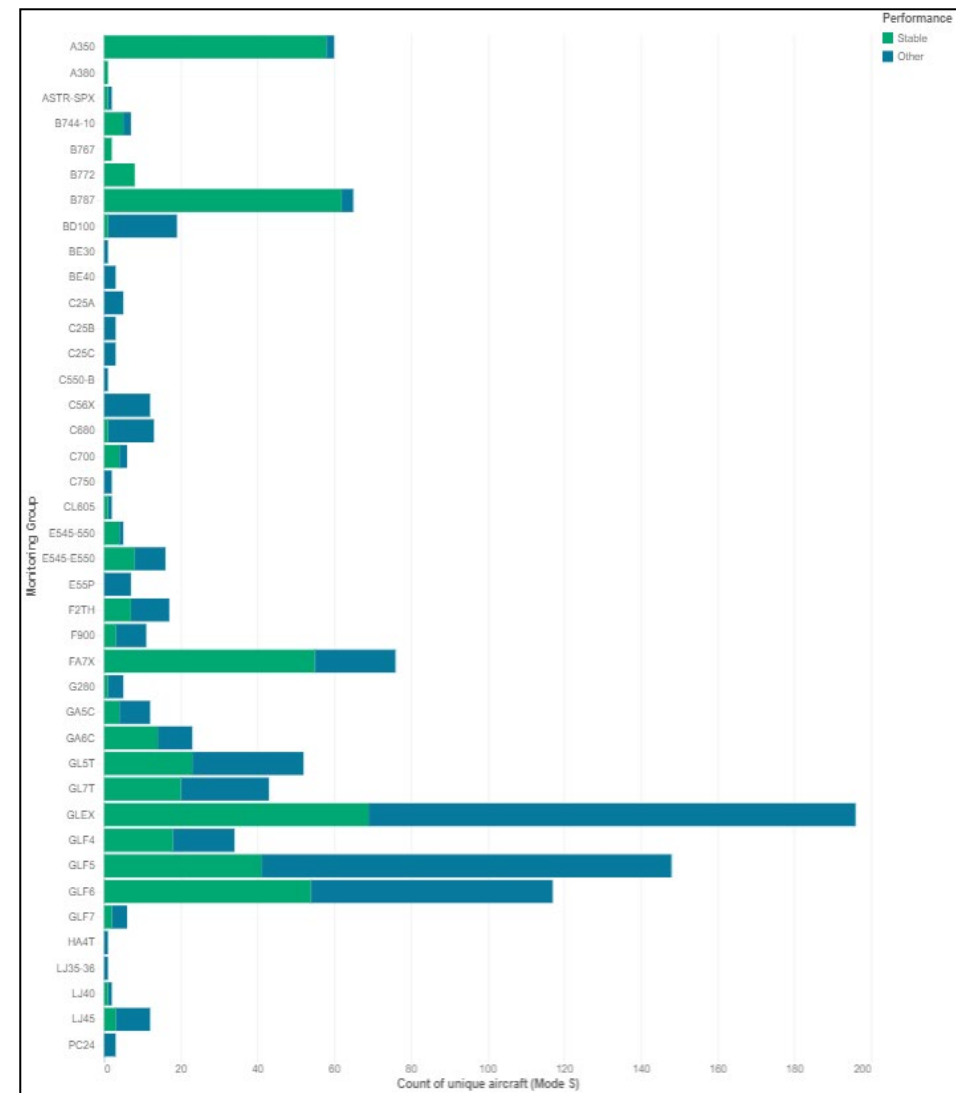
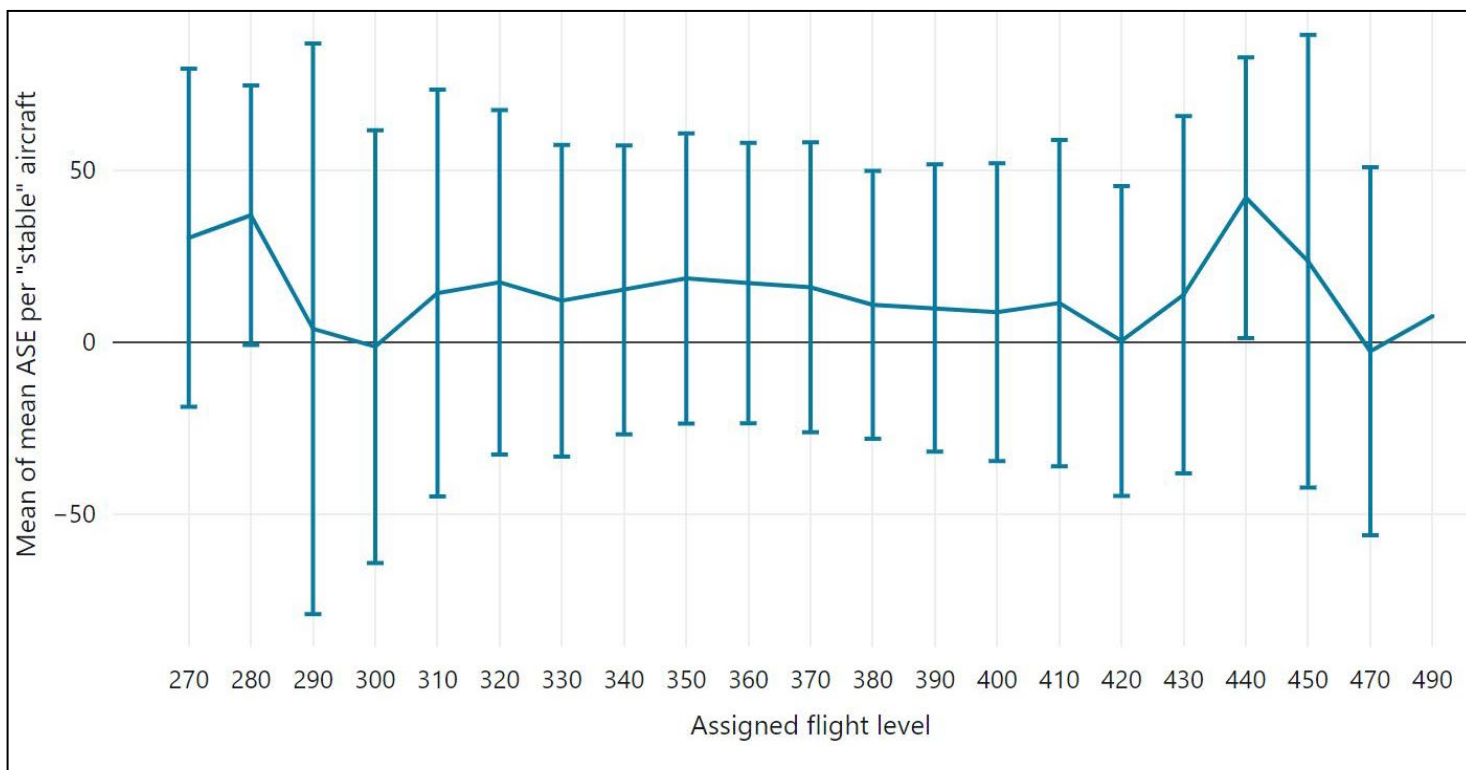
NAT Height Monitoring

- Current and future coverage
- Availability

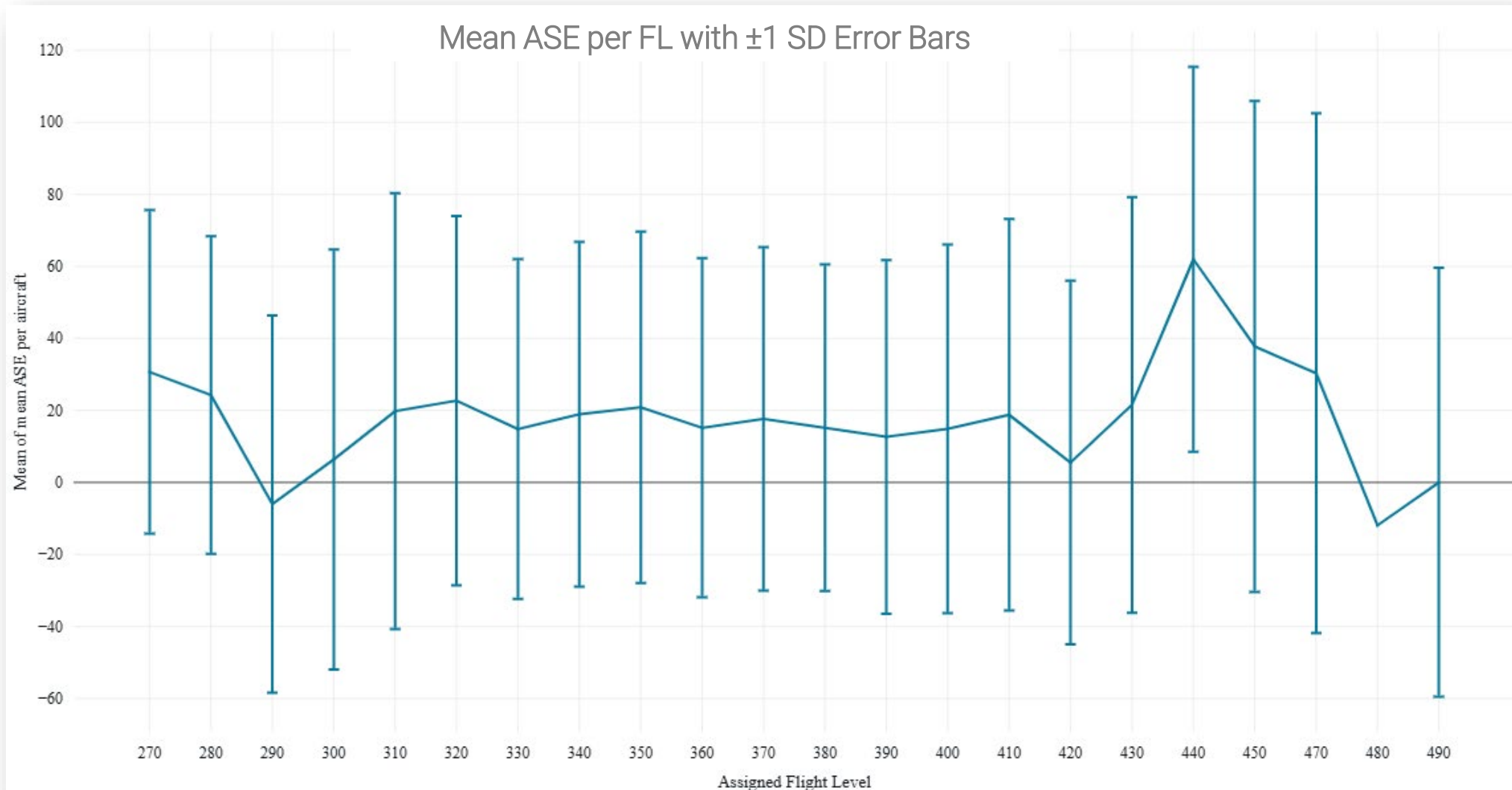


NAT Height Monitoring

- Validating for use above FL410
- Methodology

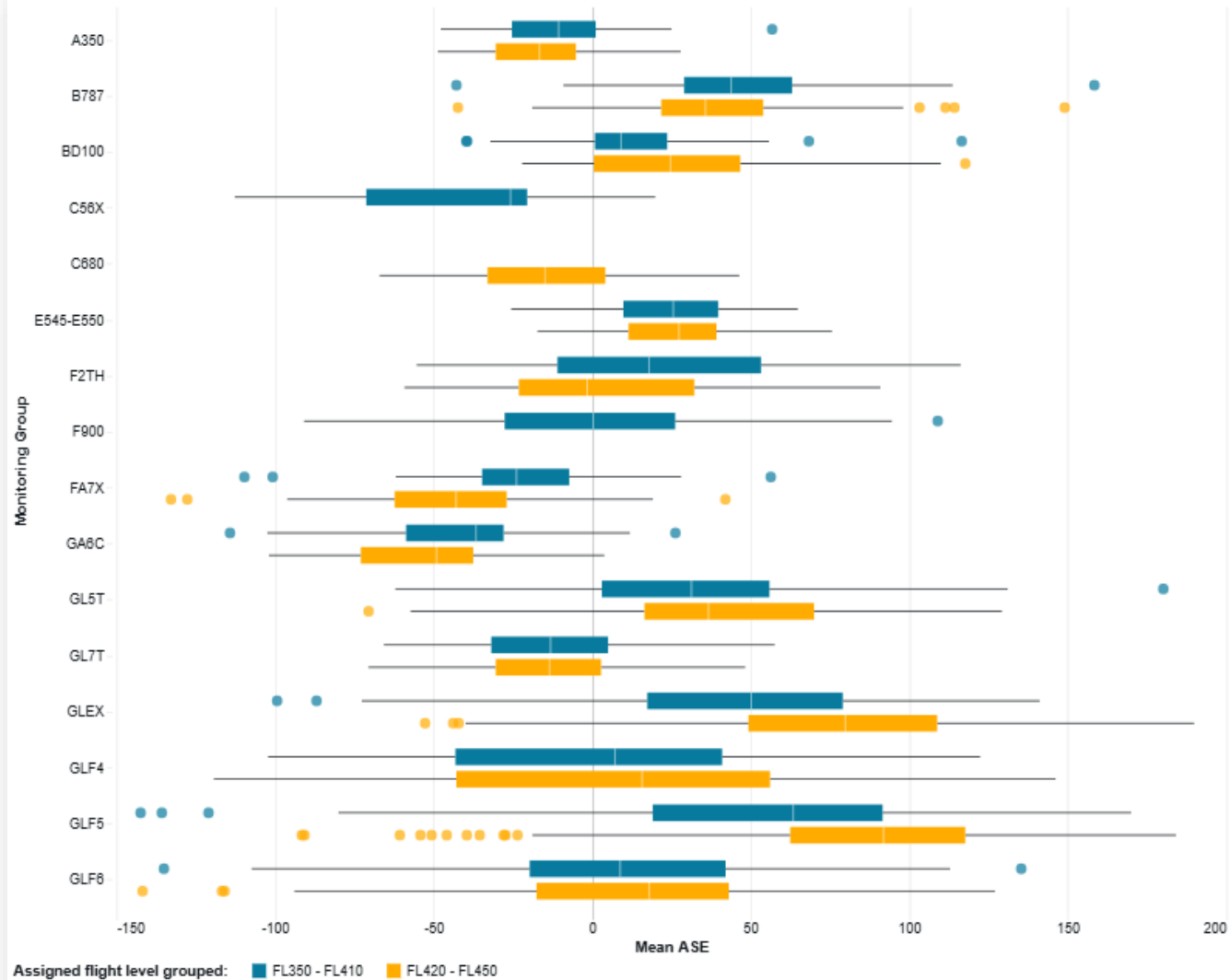


ASE Performance Analysis Above FL410



ASE Performance Analysis Above FL410

Mean ASE Boxplots per
Monitoring Group

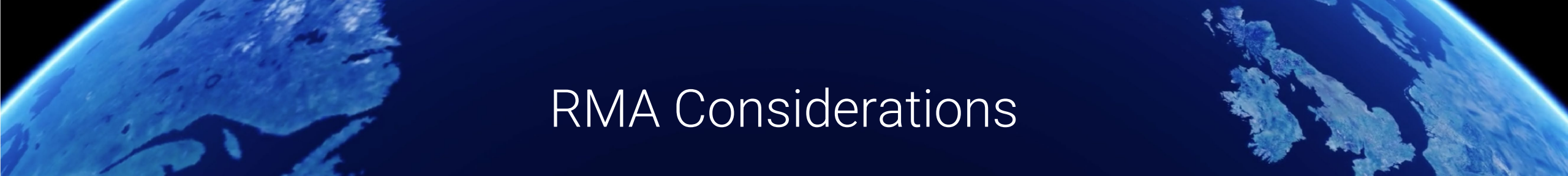




ASE Performance Analysis Above FL410

Analysis Summary

- ASE performance above FL410 is comparable with current RVSM flight levels.
- Expanding RVSM above FL410 is viable.



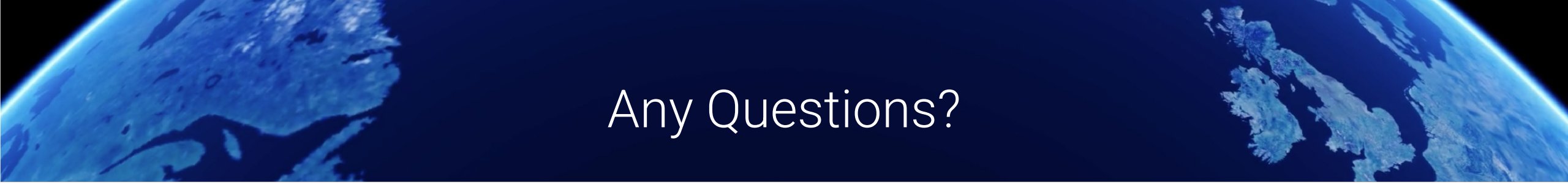
RMA Considerations

- Global ASE Monitoring Capability
- Increased operational monitoring
- Sharing of RVSM approval data
- Updates to ICAO docs
- Increased operational monitoring



What Next?

- SASP gathering input from industry and experts



Any Questions?